A METHOD OF ESTABLISHING CALLS BETWEEN A TELEPHONE
TERMINAL AND AN IP TERMINAL

The invention relates to a method of setting up
multimedia calls from a first terminal, which is a
5    telephone terminal, to a second terminal, which is
connected to an IP network.

In one prior art method of this kind a call to the
second terminal is set up from the telephone network via
an IP/PSTN (Internet Protocol/Public Switched Telephone
10    Network) gateway which converts telephone signaling into
IP signaling, for example SIP, H.323 signaling.  A voice
channel is then set up as a point-to-point RTP stream
between the second terminal and the gateway, and
simultaneously a PSTN stream is set up between the
15    calling first terminal and the gateway (RTP is a
real-time transmission protocol used in packet-switched
networks).

In that prior art method, the (called) second
terminal has a called party telephone number enabling it
20    to be selected from the (calling) first terminal and
enabling the call to be set up.

Consequently, new telephone numbers must be
dedicated to IP second terminals in order for it to be
possible to call them from first terminals.

25    Those new telephone numbers for IP terminals are
therefore additional to existing telephone numbers, which
has the drawback that a very large number of them are
required, as many as there are IP terminals.

Each IP terminal must register its dedicated
30    telephone number, which is complicated and time-
consuming.

New IP terminal telephone numbers must be integrated
into existing numbering plans, which may result in plans
becoming congested or it may even be impossible to
35    integrate the new numbers, given limited numbering
capacity (for example 10 digits in France at present),
and the increasing number of telephone numbers required.

An object of the invention is to alleviate the
drawbacks of the prior art by proposing a method and
apparatus for setting up multimedia calls from a
(telephone) first terminal to a second terminal connected
5      to an IP network, and to do so without static assignment
of a telephone number to the second terminal.

To this end, a first aspect of the invention is a
method of setting up multimedia calls from a (telephone)
first terminal to a second terminal connected to an IP
10     network, the method being characterized in that in order
to set up a call to the second terminal from the first
terminal:

· the first terminal sends to a connection server a
call request containing a predetermined (called party)
15     second identifier for the second terminal;

· on receiving the call request, the connection
server temporarily stores the (called party) second
identifier in a correspondence table in association with
a first number determined from the call request and
20     instigates the sending by the first terminal of an
incoming call to a particular second number which is a
service number connecting to a call set-up gateway, the
incoming call including a call characteristic to indicate
a relationship between the first number and the (service)
25     second number; and

· the call set-up gateway signals at least the
characteristic of the received incoming call to the
connection server, which determines the (called party)
second identifier associated in the correspondence table
30     with the first number corresponding to the signaling of
the characteristic of the incoming call in order to
signal the incoming call to the second terminal
corresponding to the (called party) second identifier
determined in this way, in order to set up a multimedia
35     communications channel between the second terminal and
the call set-up gateway, which then connects the
multimedia communications channel to the incoming call.

By means of the invention, the call to the second
terminal is set up by means of a temporary correspondence
established between the identifier of the second
terminal, the (service) second number of the incoming
5    call and the first number.  It follows that the number of
service numbers that the call set-up service requires in
order to be able to forward incoming calls to the gateway
can be limited to a predetermined number, and can even be
equal to one, and is in any event much smaller than the
10   number of second terminals.  The invention thus dispenses
with the static, systematic, and definitive assignment of
telephone numbers to second terminals, which avoids
having the same number of telephone numbers as there are
second terminals and relieves the second terminals of
15   having to register such numbers for the service.
According to other, non-limiting features of the
invention:
· the first number and the (service) second number
are telephone numbers;
20       · the (telephone) first terminal is a GPRS mobile
telephone terminal;
· the second terminal is connected beforehand to the
connection server using a presence management protocol;
· the (called party) second identifier is selected
25   on the first terminal, selection of the (called party)
second identifier on the first terminal being possible
because the presence of the second terminal has been
detected and signaled to the first terminal by the
connection server;
30       · the first number associated in the correspondence
table with the second identifier is the telephone number
of the first terminal contained in the call request and
the characteristic of the incoming call for indicating a
relationship between the first number and the (service)
35   second number designates the incoming call coming from
the telephone number of the first terminal and going to
the (service) second number;

· either the first number associated in the correspondence table with the second identifier is the telephone number of the first terminal contained in the call request and the characteristic of the incoming call for indicating a relationship between the first number and the (service) second number designates the incoming call coming from the telephone number of the first terminal and going to the (service) second number;

· or the first number associated in the correspondence table with the second identifier is the (service) second number and the characteristic of the incoming call for indicating a relationship between the first number and the (service) second number designates the (service) second number;

· the telephone number of the first terminal is contained neither in the call request nor in the incoming call;

· the connection server determines the (service) second number from a pre-stored list of service numbers available for the call request and is communicated to the first terminal in an acknowledgement sent by the connection server after the (called party) second identifier is stored in the correspondence table;

· the incoming call contains other characteristics of the communications channel to be set up which are also signaled with the incoming call to the connection server and to the second terminal;

· a first identifier of the first terminal is present in the call request and is stored by the connection server in association with the (called party) second identifier and the first number;

· the identifier is different from a telephone number of the corresponding terminal.

A second aspect of the invention is apparatus for implementing the above method of setting up multimedia calls from a (telephone) first terminal to a second

terminal connected to an IP network, the apparatus being characterized in that it comprises:

· a gateway for setting up calls between the first and second terminals;

5 · a connection server including means for receiving a call request from the first terminal and means for commanding the first terminal to send an incoming call to a particular second number which is a service number connecting through to the call set-up gateway, the

10 incoming call including a call characteristic for indicating a relationship between a first number and the (service) second number;

· a correspondence table for storing the (called party) second identifier for the second terminal

15 contained in the call request in association with the first number determined from the call request;

· first means in the call set-up gateway for signaling at least the characteristic of the incoming call to the connection server;

20 · means in the connection server for determining the (called party) second identifier associated in the correspondence table with the first number corresponding to the signaling of the characteristic of the incoming call and second means for signaling the incoming call to

25 the second terminal corresponding to the (called party) second identifier determined in this way;

· means for instigating the setting up of a multimedia communications channel between the second terminal and the call set-up gateway; and

30 · means for connecting the multimedia communications channel to the incoming call via the call set-up gateway.

The invention can be better understood on reading the following description, which is given by way of non-limiting example only and with reference to the

35 appended drawings, in which:

Figure 1 is a diagram of apparatus implementing the call set-up method of the invention;

Figure 2 is a diagram of a first embodiment of the Figure 1 apparatus using calling party routing; and

Figure 3 is a diagram of a second embodiment of the Figure 1 device using called party routing.

5    In the figures, a first user is seeking to set up a call from a first terminal T1 (a telephone terminal) to a remote second terminal T2 of a second user that is connected to an IP network such as the Internet.  Below, the first terminal T1 is typically a GPRS mobile

10   telephone terminal, but it could equally well be a fixed telephone terminal communicating via a corresponding telephone network.  The remote second terminal T2 is a fixed or mobile computer connected to an IP network, for example, and is referred to below as the IP terminal.

15   A connection infrastructure common to users of GPRS mobile terminals T1 and IP terminals provides predefined dynamic routing rules for ensuring that calls incoming to a gateway between the first and second terminals, such as a PSTN/IP gateway, are connected through to the called

20   users.

This type of infrastructure is typically an IP-based presence management infrastructure, like those used for instant messaging.

The second terminal T2 is identified in the

25   connection infrastructure by a predetermined second identifier ID2, which is typically not a telephone number and consists of an electronic mail address of the second terminal T2, for example, such as (in France) forename.name@domain.fr, where 'name' and 'forename' are

30   those of the second user.  The identifier ID2 makes identification of a second user by a first user less anonymous than a telephone number would.

In the figures, this connection infrastructure comprises one or more connection servers SMR and a

35   correspondence table TC described below.

By means of this common connection infrastructure, the first and second users can coexist in the same

identification space, the first terminal T1 can contact the connection server SMR and the connection server SMR can contact the second terminal T2. A call from the first terminal T1 to the server SMR uses the GPRS

5   telephone network, a GPRS connection, and the Internet network, and vice versa in the opposite direction. A call between the server SMR and the second terminal T2 uses the Internet in both directions. For example, the second terminal T2 has notified its presence and made a

10  connection to the connection server SMR beforehand, either at the initiative of the second user or automatically by a permanent connection when the second terminal T2 is switched on, for example by notifying its IP address and the port at which the second terminal T2

15  can be contacted. The connection to the service is effected by means of client applications in the second terminals T2 and onboard applications in the first terminals T1. These applications use IP connectivity to set up a connection with the server SMR. This type of

20  architecture is typically based on elements compatible with the presence management protocols XMPP (eXtensible Messaging and Presence Protocol), SIMPLE (SIP for Instant Messaging and Presence Leveraging Extensions), and Wireless Village (registered trade mark). For example,

25  the connection infrastructure enables the first and second users each to draw up a list of contacts or call destinations ("friends" list). The first terminal T1 is notified of the presence of the second terminal T2 on the IP network and the second terminal T2 is notified of the

30  presence of the first terminal T1 on the mobile telephone network.

To initiate a call and to connect to the service provided by the invention and to the server SMR, during a step 1, the first user selects the second identifier ID2

35  on the first terminal T1 and commands the first terminal T1 to send a call request DA containing the second identifier ID2 to the connection server SMR using a

communications protocol. For example, the first user
keys in the second identifier ID2, because the user
happens to know it, or an onboard application in the
first terminal T1 prompts the first user to call the

5      second user on the basis of the second identifier ID2 of
the second terminal T2 in the connection infrastructure,
for example by prompting the user to select from the list
of contacts stored in the terminal T1, the terminal T2
that the server SMR has detected as being present.

10      Each time that the connection server SMR receives a
call request DA, in a step 2, it associates a first
telephone number NT with the called party identifier ID2
contained therein and temporarily stores that association
in the correspondence table TC, where applicable with

15      other characteristics of the future call. For each call
request DA it receives, the server SMR determines the
first telephone number NT temporarily and dynamically on
the basis of the call request DA. This first telephone
number NT is a service number and is therefore not

20      assigned to the identifier ID2 in a static and definitive
manner, but only during the call set-up stage, for
example until a call is set up between the first and
second terminals T1 and T2 in a step 8. Consequently,
associations between identifiers ID2 and first numbers NT

25      are stored dynamically in the correspondence table TC.
In the first embodiment, shown in Figure 2, the call·
request DA contains the telephone number N1 of the first
terminal that sent it (calling party) and the second
identifier ID2 (called party). In this case, the first

30      telephone number NT is the calling party telephone number
N1 of the first terminal that sent the call request DA.
In the second embodiment, shown in Figure 3, the
call request DA does not contain the telephone number N1
of the sending first terminal (the calling party) but it

35      does contain the second identifier ID2 (for the called
party). In this case, the first telephone number NT is a
service number NS determined by the server SMR for the

call request DA containing the identifier ID2.  For example, this service number NS is determined by the server SMR from a particular list (pool) LNS of service numbers reserved in the server SMR for pending call

5     requests and is assigned to the call request DA containing the identifier ID2.  These service numbers NS can therefore be assigned to any identifiers ID2 as and when call requests reach the server SMR.

Then, in a step 3, after the ID2 – NT association

10    has been stored in the table TC, the connection server SMR acknowledges the call request DA by sending the first terminal T1 that sent it a message or a corresponding ACK signal.

Reception of this acknowledgement by the first

15    terminal T1 automatically causes it, during a step 4, to send an incoming call AE to the second number NS (a service number) communicated to the first terminal T1 in the acknowledgement, for example.  By applying the routing rules established beforehand in the telephone

20    network, this second number NS (a service number) connects through to the gateway PEA for setting up calls between the first and second terminals T1 and T2.  The incoming call AE is transparent for the first user of the first terminal T1.

25    The incoming call reaches the gateway PEA via the telephone network with SS7 signaling.  The incoming call AE contains a characteristic CAR informing the server SMR of a relationship between the first number NT and the second number NS (a service number).  This characteristic

30    CAR enables subsequent use of the first number NT to select one particular association (ID2, NT) from the associations in the correspondence table TC.

In the first embodiment, in which routing of the call is based on the calling party T1 and the calling

35    party telephone number N1, the second number NS is a service number and is therefore different from the first number NT = N1.  For example, this service number NS is

determined by the server SMR from a particular list
(pool) LNS of service numbers reserved in the server SMR
for pending call requests.  The characteristic CAR of the
incoming call AE is therefore AE (N1→NS), for example, to
5    specify a call to the (service) second number NS from the
first terminal T1 having the telephone number N1.

The (service) second number NS or the service number
list LNS has generally been reserved for the service
provider beforehand by the telephone number assignment
10   authority, and appropriate routing rules have generally
been established in the fixed or mobile telephone network
for routing these service numbers to the gateway PEA
dedicated to the service.

In the second embodiment, in which call routing is
15   based on the called party number NS in the incoming call
AE, the (service) second number NS is therefore equal to
the first number NT associated in the table TC with the
identifier ID2.  The characteristic CAR of the incoming
call AE therefore consists for example solely of the
20   mention AE(NS) of the (service) second number NS in the
incoming call, which means that the relationship between
the first number NT and the (service) second number NS is
NT = NS and that the telephone number N1 of the first
terminal T1 does not need to be sent in the incoming call
25   AE.

When the gateway PEA has received the incoming call
AE, it stores the (service) second number NS, in a step
5, as a pending incoming call to be subsequently
connected to a destination IP terminal, and signals the
30   received incoming call AE to the server SMR, for example
via the Internet (signaling SAE).  This signaling SAE
sends the data contained in the incoming call AE,
including the (service) second number NS and the
characteristic CAR; thus in the first embodiment, the
35   data that is sent comprises the telephone number N1 of
the first terminal T1 and the (service) second number NS,
while in the second embodiment, the data that is sent

comprises only the (service) second number NS. In the first embodiment, the signaling SAE could also comprise only the telephone number N1 of the first terminal T1.

5    When the server SMR has received the signaling SAE of the incoming call AE, it extracts from that signaling the characteristic CAR of the incoming call AE and consults the records present in the table TC of correspondences to determine the associated called party identifier in the correspondence table TC as a function

10    of CAR and TC. Thus the server SMR determines the second identifier ID2 (of the called party) associated in the correspondence table TC with the first number NT, which corresponds to the signaling SAE of the characteristic CAR of the incoming call AE.

15    In the first embodiment, the server SMR compares the signaled characteristic CAR = AE(N1→NS) or CAR(N1) with the records in the table TC, selects the record (ID2, N1) in the table TC on the basis of the signaled characteristic CAR = AE(N1→NS) or CAR(N1), and deduces

20    the second identifier ID2 of the terminal T2 present in that record (ID2, N1) and associated with the number N1 present in the signaled characteristic CAR, the calling party number N1 being the discriminating factor enabling the server SMR to select the record (ID2, N1) in the

25    table TC.

In the second embodiment, the server SMR compares the signaled characteristic CAR = AE(NS) with the records in the table TC, selects the record (ID2, NS) in the table TC on the basis of the signaled characteristic

30    CAR = AE(NS), and deduces the second identifier ID2 of the terminal T2 present in that record (ID2, NS) and associated with the (service) second number NS present in the signaled characteristic CAR, the service number NS being the discriminating factor enabling selection of the

35    record (ID2, NS) in the table TC.

When the second identifier ID2 (of the called party) has been determined in this way, the connection server

SMR signals the incoming call AE (incoming call notification) to the second terminal T2 corresponding to this second identifier ID2 (called party) in a step 6. This signaling SAE2 of the incoming call AE is sent to

5    the second terminal T2 via the Internet.

When it has received the signaling SAE2, the second terminal T2 sets up a multimedia communications channel CC with the gateway PEA via the Internet in a step 7, for example a voice and/or picture channel such as a voice

10   over IP (VoIP) channel. This communications channel CC is set up on the basis of other characteristics supplied to the second terminal T2 in the signaling SAE2, for example derived from the incoming call AE in the step 4 and forwarded in the signaling SAE. These other

15   characteristics relate to the assigned characteristics of the voice over IP channel, for example. Of course, the user of the terminal T2 (the second user) could refuse to allow the call to be set up, which would prevent execution of steps 7 and 8.

20   Finally, in the next step, step 8, the gateway PEA connects the communications channel CC set up with the second terminal T2 to the incoming call AE corresponding to the (service) second number NS, which incoming call it has kept pending. The call is therefore connected

25   through end-to-end between the first terminal T1 and the second terminal T2. The first terminal T1 and the second terminal T2 can then communicate with each other and exchange sound and/or pictures via the gateway PEA providing IP/PSTN conversion between them. The method

30   described can be used between other first terminals and other second terminals, of course.

In step 2, the server SMR may also store, in association with the second identifier ID2 (of the called party) or the called party service identifier ID2, the

35   first identifier ID1 (of the calling party) or the calling party service identifier ID1, i.e. the identifier

of the calling first terminal T1, present in the call request DA.

For example, the server SMR uses the calling party first identifier ID1 to verify that the first terminal T1 subscribes to the service and to execute other steps of the service if it finds that the first identifier ID1 present in the call request DA belongs to a file of users stored beforehand in the server SMR or to prevent execution of other steps of the service if it finds that the first identifier ID1 present in the call request DA does not belong to a file of users stored beforehand in the server SMR, for example by not sending the acknowledgement ACK to the first terminal T1 in step 3. The server SMR can decline to send the acknowledgement ACK to the first terminal T1 in step 3 for other reasons, for example because it detects in its database that the credit corresponding to the first identifier ID1 of the call request DA has been exceeded or has expired and/or because it detects that there are temporarily no longer any service numbers NS available for the incoming call AE because they have all been assigned to incoming calls AE at the time and/or because it detects that the first identifier ID1 of the call request DA is in a blacklist that it manages and that includes call barring.

For example, first identifier ID1 of the calling party is also sent in the incoming call AE signaled in step 6 for presentation to the second user on the second terminal T2.

After setting up the call in step 8, the server SMR can delete from the table TC the association (ID2, NT) between the second identifier N2 and the first number NT and, where applicable, other associated information.